Learning Technologies Management System (LiTMS): A Multidimensional Service Delivery Model for College Students with Learning Disabilities and ADHD

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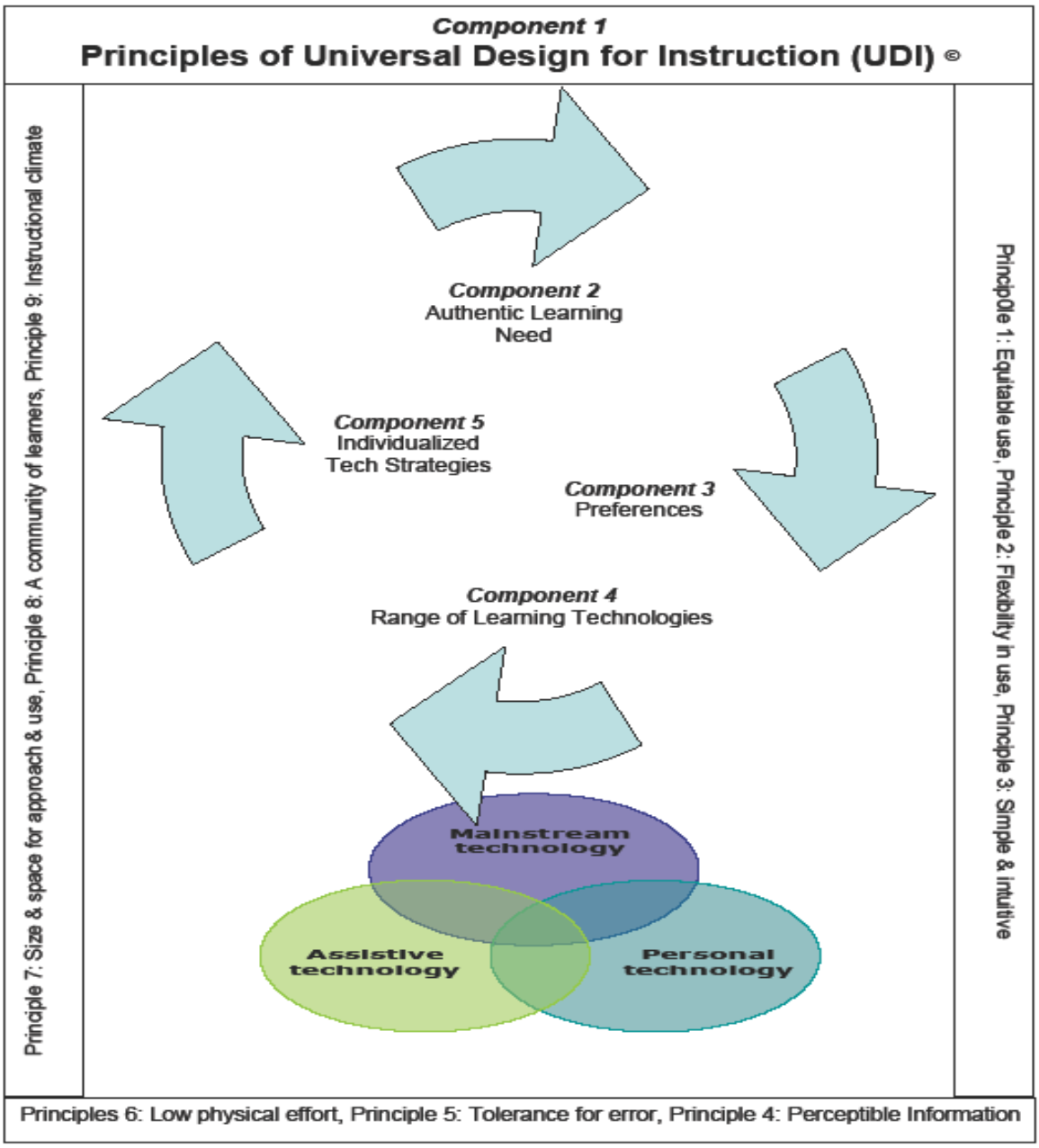
Abstract

Today's college students are expected to utilize a variety of learning technologies to succeed in higher education. Students with learning disabilities (LD) and/or Attention-Deficit/Hyperactivity Disorders (ADHD) can encounter barriers to equal access and effective learning in this new digital environment, including the development of proficiency with technology tools and self-regulation of attention while processing online information. Recognizing these trends, a research University team developed and piloted the Learning Technologies Management System (LiTMS). Service providers can implement the Principles of Universal Design for Instruction (UDI)© when providing academic supports with LiTMS. This new model is presented and illustrated with a hypothetical but increasingly common vignette. A concluding discussion articulates ways in which LiTMS can be used with *all* students in a variety of campus offices and can serve as the focus of future research.

The intent of this article is to describe a service delivery model based on the Principles of Universal Design for Instruction© (Scott, McGuire, & Shaw, 2001) that disability and academic support professionals can use to help students with learning disabilities (LD) and Attention-Deficit/Hyperactivity Disorder (ADHD) develop strategic proficiency with a range of learning technologies. The Learning Technologies Management System (LiTMS) model (see Figure 1) was piloted by the authors during a two-year period in a University office with a model program for serving undergraduates with LD and ADHD (Brinckerhoff, McGuire, & Shaw, 2002). Program staff and Learning Specialists, (i.e., graduate assistants who provide individualized services focusing on learning and compensatory strategies), participated in a dynamic process of conceptualizing, piloting, and refining the model. Each component is described using examples from a vignette involving "Susan." Implications including guidelines for applying the LiTMS model in campus offices that serve *all* college students and areas for future research are addressed.

Figure 1. Learning Technologies Management System (LiTMS) Model



Rationale for Developing the Model

Learning Technologies

Learning technologies, defined as "any application of technology, particularly computer and information technology, which contributes to the learning process" (Finnis, 2004), are dramatically altering college instruction (Chickering & Ehrmann, 1996). According to the U.S. Department of Labor:

> Most college and University faculty extensively use computer technology, including the Internet; e-mail; CD-ROMs; and programs, such as statistical packages. They may use computers in the classroom as teaching aids and may post course content, class notes, class schedules, and other information on the Internet (http://www.bls.gov/oco/ocos066.htm).

While effective learning is not guaranteed by the use of technologies, learning can be hindered by the inappropriate application of these pedagogical tools by faculty and/or students (Bransford, Brown, & Cocking, 2000).

A Need to Close the Gap

Preparedness for college studies now requires proficiency in the use of learning technologies. Yet, given the gaps in skill levels of high school students with disabilities reported in literature, it is predictable that some students will enter postsecondary education with limited knowledge and fluency in the use of these technologies and will seek assistance to develop these skills (Marino, Marino, & Shaw, 2006). The National Council on Disability (2000) reported that "the rapid acquisition of educational technology has not sufficiently addressed the needs of students with disabilities. Access for students with disabilities is just beginning to be identified as an important factor when purchasing educational technology" (p. 25).

A recent survey of college students with LD and ADHD and students without disabilities found that both groups reported high threshold levels of comfort and fluency with learning technologies (Parker & Banerjee, 2007). However, notable differences in specific skills were found. Students with disabilities indicated a lower level of comfort with e-mail and multitasking on a computer (i.e., online literature searches including reading online) than did their peers without disabilities. A key focus of the LiTMS model emanated from the gap our students identified and their need to become more adept in technology skills relating to course demands.

LiTMS: A Service Delivery Model for Technology Mediated Instructional Support

This section provides details about the five components of the LiTMS model (see Figure 1). A vignette involving a hypothetical student, "Susan," is used to illustrate each component. Consider the following scenario in which a freshman introduces herself to the disability service provider during the first week of classes.

> *Hi, I'm Susan. It's nice to meet you. I know this is our first session but I have to tell you that I'm already overwhelmed by all my assigned readings this semester. My British Lit professor decided to replace her textbook with several articles. She said the readings and other resources are online, but it's taking me forever to log onto the course web site! I've heard of text-to-speech software. Would that be faster for me to try now rather than having your office order CD's or tapes of all those articles? Oh, and after we take care of my accommodations, can we work on some reading strategies for finding main ideas? I'm a visual learner and started working with concept maps over the summer. Is there a way I can turn those maps into study guides?*

Component 1: Universal Design for Instruction (UDI)

The boundary encompassing the LiTMS model is the conceptual framework of Universal Design for Instruction (UDI) (Scott, McGuire, & Foley, 2003) and its nine Principles© (Scott et al., 2001) adapted from the concept of universal design (UD) in the field of architecture. UD comprises proactive ways to incorporate accessibility features into spaces and product designs from inception to completion (Center for Universal Design, n.d.). UDI is a paradigm for proactively designing and using inclusive instructional strategies that benefit a broad range of learners including those with disabilities (Scott et al., 2003). To implement this paradigm, the Principles of UDI©, illustrated in a clockwise format in the boundary in Figure 1, delineate considerations that are important in creating accessible learning environments and inclusive elements of instruction.

The LiTMS model extends this approach to disability services where service providers offer instruction (e.g., learning strategies, rubrics for using assistive technology) or help students access information from textbooks, web sites, e-mail exchanges, class notes, and other sources. Just as the Principles provide college faculty with a decision-making framework to create accessible courses (see www.facultyware.uconn.edu), UDI is the backdrop and foundation of the LiTMS model for service providers who offer one-on-one, individualized academic assistance to students.

Component 2: Authentic Learning Need

As illustrated in Figure 1, the impetus for a student's interaction with service providers is often a genuine need for learning assistance or accommodation. To begin the conversation and set a welcoming, non-judgmental tone (UDI Principle

9, Instructional Climate), the service provider might ask, "What *authentic need* does this student want help with that either involves technology or could be addressed by learning technologies?" Susan asked her service provider if concept maps could be turned into study guides, which becomes one of her authentic learning needs.

The disability service professional might consider Inspiration® software as a viable solution. Exploration of this software with Susan could address Principle 4 (Perceptible Information) if the concept maps would allow her to quickly see key points from her British Literature readings and how these ideas relate to one another. Responding to authentic needs provides a timely and relevant focus on technology without requiring busy students to find additional time for stand-alone training in the use of digital tools.

Component 3: Preferences

As a student and the OSD service provider clarify authentic learning needs, other elements of the LiTMS model come into play. Service providers should consider the student's *preferences*, once again drawing upon the UDI principles. Susan described herself as a visual learner. While considering a process for helping Susan learn how to use mapping software, the service provider asked, "How would you like to remember the steps for using this software?" In doing so, the service provider extended the application of Principle 9 (Instructional Climate) and Principle 2 (Flexibility in Use) by presenting information according to Susan's stated learning preference. Susan indicated that she would prefer to see a list of simple steps to prompt her recall while exploring the new technology. The service provider decided to write a brief version of each step on a whiteboard near the desk as they continued working together (UDI Principle 5: Tolerance for Error).

Component 4: Learning Technologies

In our setting, learning technologies, broadly categorized as "mainstream," personal, and assistive (see Figure 1), are present in many contexts. Increasingly, all students require proficiency with *mainstream* technologies, those used by the institution and faculty to deliver coursework and communicate with students, to succeed in today's postsecondary environments. Examples of mainstream technologies include course management systems such as WebCT/Vista, Internet-based search engines, and presentation software such as PowerPoint® and Inspiration® (Allen & Seaman, 2005). Undergraduate students continue to outpace other demographic groups on campus in the use of personal technologies ("Freshmen arrive," 2006) such as iPods®, smart phones, and personal digital assistants (PDA's). These digital tools allow students to download professors' podcasts, create weekly calendars in electronic formats, and schedule study group meetings via text messaging. Some college students with LD and ADHD also use *assistive* technology (AT) to *access* learning. AT has been defined as "any item, piece of equipment, or product system whether acquired commercially off the shelf, modified or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (http://www.section508.gov/docs/AT1998.html, n.d.). Common examples of assistive technologies include audio books, screen readers (i.e., voice output systems that read back text displayed on the computer screen), and speech recognition systems (i.e., systems that allow the user to operate the computer by speaking to it) (Day & Edwards, 1996).

What *learning technologies* are required or available to meet a student's authentic learning needs? Consideration of this question shifts the implementation of the LiTMS model from Component 3 (preferences) to Component 4 (learning technologies). The service provider introduces Inspiration® software at this stage to explore its potential for addressing some of Susan's authentic learning needs. While demonstrating relevant features of the software, the service provider also asks Susan how she remembers new steps or procedures when working by herself. Susan quickly reaches into her backpack and retrieves a sleek red cell phone. Smiling, she confidently announces that she "never leaves home without it." In consideration of Susan's preferences and the various types of learning technologies that might address her authentic learning needs, the disability service provider demonstrates Principle 2 (Flexibility in use) in finalizing a plan for demonstrating new strategies. Susan's cell phone will take on the function of a memory prompt, allowing Susan to tap into her preferences and building on Principle 4 (Perceptible Information).

Component 5: Individualized Strategies for Learning Technology Proficiency

When developing new academic strategies, students with LD and/or ADHD have demonstrated deficits in the ability to self-regulate their attention to task (Ruban, McCoach, McGuire, & Reis, 2003). Given the importance of self-regulation skills in digital learning environments, service providers can help students develop individualized ***procedural*** and ***metacognitive*** strategies for using technologies to address their authentic learning needs. Procedural strategies are adapted from the concept of "procedural scaffolding" (Hannafin, Land, & Oliver, 1999) and can be thought of as the steps one uses to complete a process or activity. The service provider proceeds to model and then have Susan practice steps for creating a map with Inspiration® software and inserting review questions into the map with the software's "post-it" note feature. Once Susan demonstrates some proficiency with this new learning technology, the service provider might address UDI Principle 6 (Minimizing physical effort) by asking her, "Can your cell phone remind you later of the steps you follow to use Inspiration®?" To ensure equitable use and accessibility to this information (Principle 1), the service provider helps Susan record and save a brief version of the steps in her cell phone's List file. They also send a copy of the list to Susan's e-mail account so that she has access to another version of these self-guiding directions.

Metacognitive strategies can be thought of as the underlying process for planning and monitoring the effectiveness of one's use of procedural and other cognitive strategies. Metacognitive strategies allow learners to identify what they want to know, reflect upon their learning style to choose effective approaches to new learning activities, monitor whether those approaches are working, and redirect their behavior when new learning approaches are needed (Hannafin et al., 1999). For a series of steps on how to provide instruction in learning strategies, see Beckman (2002). With direct instruction or modeling, students can adopt a problem-based approach to applying the new technology in a self-determined manner that addresses their authentic learning need (Knowles, 1990).

Discussion

Increasingly, college students like Susan are expected to be proficient in the use of "mainstream" technologies or already use personal technologies that hold the promise of helping them learn more efficiently. While they may be eligible for assistive technology such as audio books, students may be able to derive greater benefit from these access tools with the development of personalized procedural and metacognitive strategies. Many colleges and universities are now moving beyond the legal compliance model of disability access to a support model by offering strategy instruction to promote greater independence and learning self-efficacy (Harding, Blaine, Whelley, & Chang, n.d). The LiTMS model can be applied in the numerous OSD offices that currently offer these services or strategically plan to do so in the future. In this way, the model extends the literature on Universal Design by providing a piloted framework that disability service providers can use in their own work with students including examples of the nine Principles of Universal Design for Instruction©.

In addition to OSD settings, the LiTMS model can be adapted by a range of student services professionals. Writing Centers and Academic Skills Centers are two examples of offices that routinely provide individualized assistance to any student taking courses at that institution. Staff members are often trained in facilitation and instructional methods and help students enhance their writing or study skills while working on current course assignments. College technology labs and libraries also provide individualized assistance involving technologies such as Internet search engines, course web sites, and PowerPoint software to a wide variety of students who request assistance with research and presentations. Disability service providers can play an important new consulting role by helping campus colleagues learn about and adapt the LiTMS model, beginning with an understanding of the nine Principles of Universal Design for Instruction©. Such collaborations hold the promise of widening institutional access in and out of the classroom.

With consideration of the OSD program evaluation literature (Casey, 2006; Goodin, Parker, Shaw, & McGuire, 2004), the LiTMS model provides a new opportunity to extend the research base on efficacious support services. The model was developed and piloted at a single research intensive institution with a limited number of students. Replication is warranted, and empirical evidence of "best practices" relating to service delivery models such as LiTMS holds promise for postsecondary personnel who increasingly are called upon to develop and evaluate universal approaches to accessible education that involve the use of learning technologies.

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